

STATINTL EVALUATION OF THE [ ] PHASE II, TRIAL I GRATING:

It would be useful to test the grating in the system for which it has been ruled, but it is by no means necessary. The specifications on performance -- dealing with relative order intensities, energy distributions, spacing, etc. -- are clearly spelled out in the viewer specifications.

The entire technical evaluation can be accomplished with an investigation of the Fraunhofer pattern of the grating. The optical system in the attached sketch will provide the necessary means for the following tests which should be performed:

1. Verification of grating spacing. Measurement of the separation of the Fraunhofer orders will be sufficient to determine line frequency (to do so requires the focal length of  $L_2$  to be known and a specific illuminating frequency used; in the case of a Mercury arc, the  $5461 \text{ \AA}$  line is the obvious choice.)

2. Determination of energy distributions. A photometer in the Fraunhofer plane can establish the strengths of the twelve (12) necessary side orders relative to the central order. The strength of the central order relative to the energy in the pattern without the grating provides the reading necessary to establish the 3% minimum energy level. These readings are then subjected to the three basic criteria which they must meet:

a) No more than a ratio of 1.4 in energy from order to order.

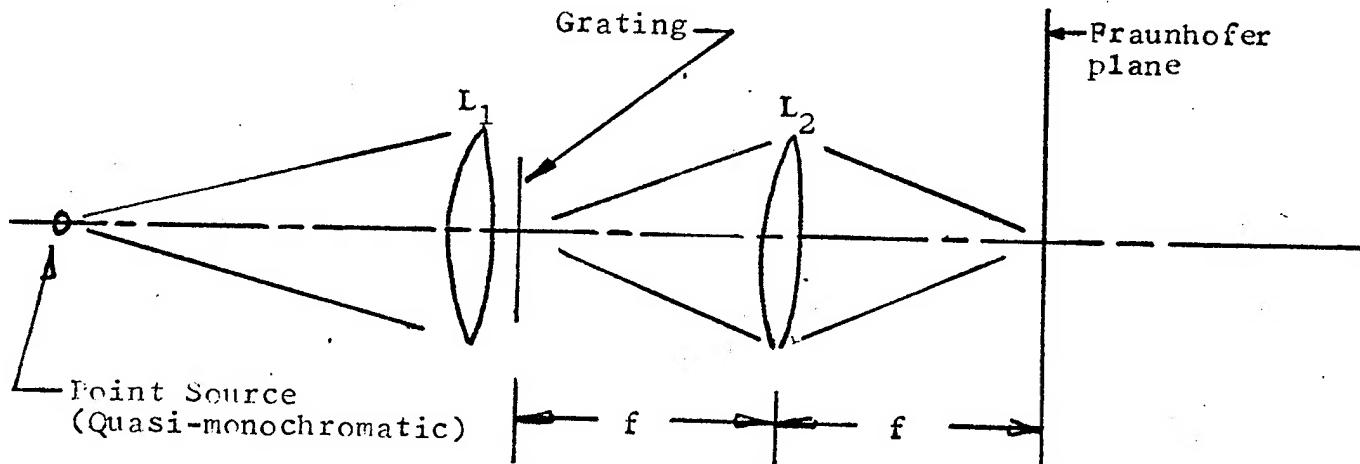
b) No greater than a 2:1 fall-off from the brightest to the least bright order.

c) 3% minimum energy in least bright order.

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3. Some additional things to look for (although they are not explicitly covered in the specifications):

- a) the presence of blaze in the rulings which tends to put unequal energy into the same order-pair.
- b) Evenness of ruling and replication which can easily be seen by masking out parts of the grating and examining some relative intensities.
- c) The presence of diffusing matter in the grating: it should not diffuse or it defeats its purpose. A good, simple test is to put the grating in contact against printed matter and to observe the quality of its image.



Optical system for testing grating. Lenses  $L_1$  and  $L_2$  should be used at no faster than  $f/8$ , and focal length of  $L_1$  should be consistent with the size of the point source to achieve the proper amount of coherence.